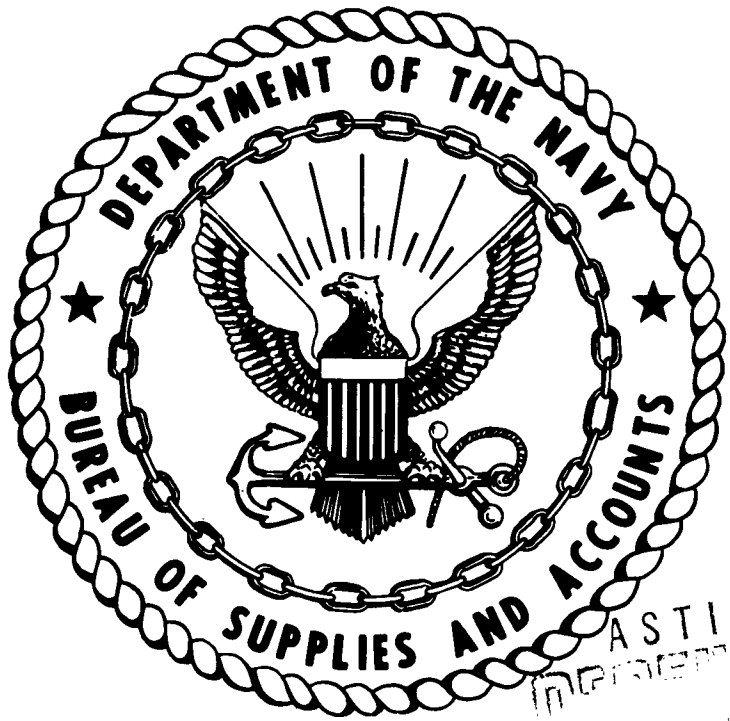
AD 400 572

EVALUATION OF MOLDED ALASKAN BREADED SHRIMP



U. S. NAVAL SUPPLY RESEARCH AND DEVELOPMENT FACILITY
BAYONNE, N. J.

ALL PHOTOGRAPHS
CONTAINED HEREIN
ARE
OFFICIAL NAVY PHOTOGRAPHS
UNLESS OTHERWISE NOTED

TECHNICAL REPORT REVIEW

EVALUATION OF MOLDED ALASKAN BREADED SHRIMP

Task and Subtask NT-F015-13-002-69-56
System No. 2202-06956-2

Date Released: 28 December 1962

Classification: UNCLASSIFIED

Distribution: In accordance with distribution list.

Remarks: This report is approved for release by the Bureau of Supplies and Accounts

Chief, Bureau of Supplies and Accounts
Department of the Navy
Washington 25, D. C.

/S/ F. C. BREHM
By direction

RECOMMENDED DISTRIBUTION LIST

Chief, Bureau of Supplies and Accounts (W1), Navy Department, Washington 25, D. C. (7)
Chief, Bureau of Supplies and Accounts (ON), Navy Department, Washington 25, D. C. (1)
Chief, Bureau of Medicine and Surgery, Navy Department, Washington 25, D. C. (2)
Office of Naval Research (466), Navy Department, Washington 25, D. C. (1)
Commanding Officer, U. S. Navy Subsistence Office, Washington 25, D. C. (2)
Navy Liaison Officer, Armed Forces Food and Container Institute, U. S. Army Quartermaster Research and Engineering Command, 1819 West Pershing Road, Chicago 9, Illinois (1)
Commandant, Armed Forces Food and Container Institute, U. S. Army Quartermaster Research and Engineering Command, 1819 West Pershing Road, Chicago 9, Ill. (1)
Chief, Food Service Division, Army Subsistence Center, 1819 West Pershing Road, Chicago 9, Illinois (1)
Director of Research and Development, Headquarters U. S. Air Force, Washington 25, D. C. (1)
Commandant of the Marine Corps, Washington 25, D. C. (Attn: Research and Development Section) (1)
British Navy Staff, British Embassy, 3100 Massachusetts Ave., N. W., Washington 8, D. C. (1)
Defense Research Member, Canadian Joint Staff, 2450 Massachusetts Ave., N. W.., Washington 8, D. C. (1)
Naval Member, Canadian Joint Staff, 2450 Massachusetts Ave., N. W., Washington 8, D. C. (1)
Office of the Admiralty, British Navy Staff, P. O. Box 85, Benjamin Franklin Station, Washington, D. C. (1)
Commander, Armed Services Technical Information Agency, Arlington Hall Station, Arlington 12, Virginia (Attn: TIPDR) (10)
Officer in Charge, U. S. Naval Supply Research and Development Facility, Naval Supply Center, Bayonne, N. J. (10)
Commander, Defense Subsistence Supply Center, 226 West Jackson Blvd., Chicago 6, Illinois (2)
National Security Industrial Association, Sub-Committee on Prefabricated Foods, (Attn: Mrs. Edythe Robertson), Slater Food Service, Lombard and 25th Streets, Philadelphia 46, Pa. (4)
Director, Bureau of Commercial Fisheries, C Street between 18th and 19th Streets, N. W., Washington 25, D. C. (1)
Technological Laboratory, Bureau of Commercial Fisheries, Emerson Ave., Gloucester, Mass. (1)

U. S. NAVAL SUPPLY RESEARCH AND DEVELOPMENT FACILITY
BAYONNE, N. J.

EVALUATION OF MOLDED ALASKAN BREADED SHRIMP

by

H. Gorfien
B. MacNulty
I. Seidenberg

Task and Subtask NT-F015-13-002-69-56
System No. 2202-06956-2

August 1962

Reviewed by

A. C. Avery, Technical Director
Food Science and Engineering Division

Charles M. Schoman, Jr., Ph.D.
Chief Scientist

Herman Strock, Captain SC USN
Officer in Charge

TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

ILLUSTRATIONS

LIST OF TABLES

ABSTRACT

Alaskan breaded shrimp was evaluated and compared with Navy-issue 30% and 40% breaded shrimp. The test item was found to have good organoleptic, utility and nutritional values, and a favorable price position. However, since the Alaskan breaded shrimp is molded from small shrimp and has a different flavor and texture, it is recommended that Alaskan breaded shrimp be used in Navy general messes as a shrimp "patty" or "burger" rather than a replacement for Navy-issue breaded shrimp; particularly, when Navy-issue breaded shrimp is in short supply and the cost is deemed excessively high.

SUMMARY

PROBLEM

To determine the suitability of Alaskan breaded shrimp (molded style) for Navy use.

CONCLUSIONS

1. Alaskan breaded shrimp is an acceptable item from an organoleptic and utility standpoint.

2. Alaskan breaded shrimp should be considered for use, when Navy-issue 30% and 40% breaded shrimp is in short supply and the cost per pound as purchased, (A.P.) is deemed excessively high. However, the Alaskan breaded shrimp should not be considered as a shrimp replacement item for Navy-issue shrimp but, rather, as a shrimp "patty" or "burger".

3. The cooked edible weight per portion of Alaskan breaded shrimp (as established by the field tests) is less than the portion of cooked edible weight of Navy-issue 30% and 40% breaded shrimp. For this reason a portion of Alaskan breaded shrimp provides less protein, fat and total calories than the aforesaid Navy-issue shrimp portions.

4. For the past year, the cost per portion of Alaskan breaded shrimp was less than: (a) Navy-issue 30% breaded shrimp in all 12 months; and (b) Navy-issue 40% breaded shrimp in 11 out of 12 months.

5. Alaskan breaded shrimp absorbs less fat on frying than does Navy-issue breaded shrimp.

6. Alaskan breaded shrimp has no plate waste in the form of inedible tail shell as compared to Navy-issue breaded shrimp which contains from 9% to 10% inedible tail shell.

RECOMMENDATION

It is recommended that Alaskan breaded shrimp be used in Navy general messes as a substitute, but not as a replacement for Navy-issue breaded shrimp. This substitution would apply when the latter is in short supply and its cost is deemed excessively high. When so used, the Alaskan breaded shrimp should be referred to as a shrimp "patty" or "burger".

EVALUATION OF MOLDED ALASKAN BREADED SHRIMP

INTRODUCTION

Within the last eight years, the use of frozen breaded shrimp has made a significant contribution to galley operations, menu planning, and menu versatility. Institutions and restaurants have utilized frozen breaded shrimp because of its convenience, and time and labor saving characteristics.

Currently, the Navy authorizes the use of frozen breaded shrimp under FSC Group 89 Subsistence Material(1). In view of the fact that shrimp has been in short supply and prices have been high, the Navy Subsistence Office requested the Naval Supply Research and Development Facility to evaluate a molded product referred to as Alaskan breaded shrimp(2)(3).

DESCRIPTION OF TEST PRODUCT, ALASKAN BREADED SHRIMP

The following description of the test product (shown in Fig. 1, page 3) is a concise extraction from information provided by the supplier.

This product is made from the cold water small shrimp of the Pacific Northwest.

The shrimp are caught by conventional shrimp trawlers using regular shrimp trawling gear. Standard practices are followed in the washing and icing of the shrimp aboard the vessels.

Ashore, the shrimp are mechanically peeled of all shell. The shrimp meats are then thoroughly drained of flume water, and all surface moisture is removed. A careful visual inspection is made for any loose shell.

The shrimp meats are then tightly packed, (free of entrapped air) into tubes of a soft material such as polyethylene. The open end is sealed. To shape the desired form, and limit expansion during freezing, the circular tube of shrimp meat is then locked into special molds. No salt or other seasoning is added to the shrimp meat.

Freezing of the shrimp in molds is accomplished very rapidly either in air blast tunnels, or in hydraulic plate freezers, at an operating temperature of minus 30°F or lower. Dehydration during the freezing operation is prevented by the film completely sealing the shrimp meat.

When fully frozen, the shaped logs are taken from unlocked molds, carefully packed in cartons and shipped frozen to shrimp breading plants for processing.

The processing plants "temper" the logs to a temperature that gives maximum slicing efficiency. The tempered logs are then stripped of their covering and sliced in a frozen food slicer to a uniform thickness. The slices are fed into commercial breading machines, where they receive the desired percentage of batter and breading. The uniform slices--which are still frozen--are packed to controlled package weights and placed in blast or plate freezers to freeze the breading. The product is then packed in cartons for distribution and sale.

The supplier of Alaskan breaded shrimp has also provided a fact sheet which maintains that the use of this product will have the following advantages over conventional frozen breaded shrimp:

1. Provide more food value at a lower cost.

2. Supply breaded shrimp "for military specifications at in-plant costs of from $0.06 to $0.20 per pound under present costs".

3. A saving of $0.02 to $0.07 per serving based on three servings per pound.

4. A storage life of 12 months, at uniform storage temperatures from 0°F to minus 10°F.

Since the supplier has represented this product as a source of more food value at a lower cost than frozen breaded shrimp, the subject of cost and food value will be taken into consideration in the evaluation.

FRYING TESTS

Procedure

A series of frying tests were conducted at the NAVSUPRANDFAC in calibrated thermostatically controlled deep-fat fryers, and in the field in deep-fat fryers as found in operation. Alaskan breaded shrimp, and 30% and 40% Navy-issue frozen breaded shrimp were "fried off" at 350°F* until golden brown. Information sought during the tests were:

1. Utility, including breakage during handling, of Alaskan breaded shrimp versus Navy-issue 30% and 40% breaded shrimp (based on visual observations).

2. Yield of the shrimp products.

3. Fat absorption of Alaskan breaded shrimp versus Navy-issue 30% and 40% breaded shrimp.

*As indicated by a portable deep-fat fryer thermometer.

The quantity of fat absorbed by the three shrimp products was determined by two different methods: (1) Volumetric replacement in the fryer of the fat absorbed by the shrimp during the frying cycles; and (2) Chemical analysis of the fried shrimp.

Prior to frying, the Percent Breading on Alaskan breaded shrimp was determined by the method described in the "United States Standards for Grades of Frozen Raw Breaded Shrimp"(4).

Findings

The reported test results represent an average of four separate frying cycles.

1. Even though the Alaskan breaded shrimp are composed of many small shrimp, breakage during frying was less than 1%.

2. The tendency for the Alaskan breaded shrimp to rest upon each other (flat side to flat side) during the frying cycle resulted in some unacceptable products (see Fig. 1).

3. Alaskan breaded shrimp required an approximate 3 minute frying period; whereas, the Navy-issue 30% and 40% breaded shrimp required an approximate 4 minutes.

4. Yields of the three shrimp products are shown in Table I, page 4.

5. The fat absorption comparisons of the three shrimp products are shown in Table II, page 4.

6. The Alaskan breaded shrimp was found to have a breading content of 30%.

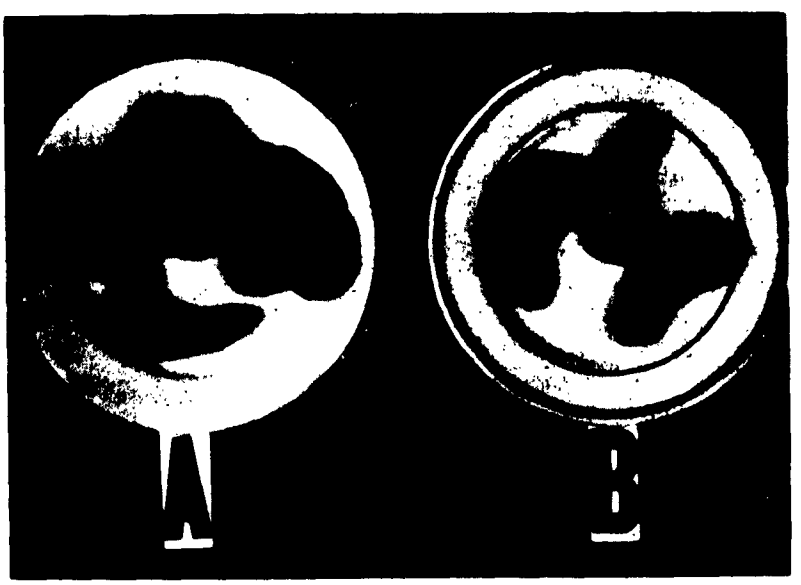


Fig. 1 - Comparison of Acceptable (A), and Unacceptable (B) Fried Alaskan Breaded Shrimp. NAVSUPRANDFAC Photo No. 842-1.

TABLE I. COMPARISON OF APPROXIMATE YIELD OF THREE TYPES OF FRIED SHRIMP

Product	Fried Shrimp Cooking Yield* (%)	Edible Cooked Yield (%)
Alaskan Breaded Shrimp	68.38	68.38
30% Breaded Shrimp	81.15**	73.44***
40% Breaded Shrimp	81.25**	73.37ø

*Fried shrimp yield was calculated from the difference in weight before (frozen) and after frying.

**Includes tail.

***81.15 x 90.5% = 73.44% (does not include 9.5% tail; see Table V, page 10).

ø81.25 x 90.3% = 73.37% (does not include 9.7% tail; see Table V, page 10).

TABLE II. COMPARISON OF FAT ABSORPTION BY FRYING SHRIMP

Product	Fat Absorption	
	By Volumetric Replacement of Fat in Fryer (oz. fat/lb. shrimp)*	By Chemical Analysis of Shrimp (oz. fat/lb. shrimp)*
Alaskan Breaded Shrimp	1.15	1.30
30% Breaded Shrimp	1.88	1.81**
40% Breaded Shrimp	1.81	1.75**

*Ounces of fat absorbed during the frying cycle per pound of raw shrimp.

**For the calculation, the percentage fat absorbed by the breading on the inedible tail shell was assumed to be approximately the same as that absorbed by the breading on the edible shrimp.

Discussion of Findings

The type and percent of breakage of Alaskan breaded shrimp during handling and frying was considered insignificant. When breakage did occur, the individual shrimp generally broke into 2 pieces of usable size. It was also observed that the Alaskan breaded shrimp tended to rest upon each other (flat side to flat side), resulting in unacceptable fried shrimp (Fig. 1). This problem was rectified by the occasional stirring of the shrimp at the beginning and middle of each frying cycle, or whenever the cook deemed it necessary.

Alaskan breaded shrimp is a heavier, wider and thinner product than Navy-issue breaded shrimp, and has a greater ratio of surface to weight. In theory this should result in (1) a greater moisture loss during frying, and (2) a shorter frying cycle. As tested, the product did lose more moisture (See Table V, page 10, under Chemical Analysis section), and the frying cycle was approximately 1 minute less than for the Navy-issue breaded shrimp. The larger moisture loss is an explanation as to why the yield of the Alaskan breaded shrimp was less than that of the comparison products.

Since the Alaskan breaded shrimp released more moisture during the frying operation, it may be assumed that the "steaming off" of the shrimp (especially during the initial stage of the frying cycle) tended to inhibit the fat absorption prior to the sealing-off of the exterior surface of the shrimp by protein denaturation and gelation. Theoretically, this is a reason for Alaskan breaded shrimp exhibiting the lowest fat absorption.

ACCEPTABILITY

Procedure

Acceptability tests were conducted on the NAVSUPRANDFAC taste panel, and in the field at the N. Y. Atlantic Group Reserve Fleet, Bayonne, N. J. Tests at the Facility were comparison type tests in which the Alaskan breaded shrimp was compared with Navy-issue 30% and 40% breaded shrimp. Alaskan breaded shrimp was also field tested. A special acceptability form* was utilized in which the participants were not aware of what food item was being evaluated.

In addition to the above organoleptic tests, the NSIA subcommittee on Prefabricated Foods was asked to evaluate and comment on the Alaskan breaded shrimp.

The completed questionnaires obtained from the NAVSUPRANDFAC taste panel and the general mess were analyzed to determine the acceptance rating and other pertinent data.

Findings

1. NAVSUPRANDFAC acceptability test results showed that Alaskan breaded shrimp had a hedonic rating of 6.36 to 6.86 (like slightly) as compared to a hedonic rating of 7.57 (like moderately) for 30% breaded shrimp, and a hedonic rating of 7.76 (like moderately) for 40% breaded shrimp. See Table III.

2. The Field acceptability test results showed that Alaskan breaded shrimp had a hedonic rating of 6.46 to 6.83 (like slightly).

---

*See Appendix B.

3. The NSIA subcommittee on Prefabricated Foods found that Alaskan breaded shrimp had neither the flavor, texture or appearance of conventional breaded shrimp. However, this committee considered the Alaskan breaded shrimp to be an acceptable shrimp "patty" or "burger".

4. The field test results indicated that four Alaskan breaded shrimp represents an adequate serving. Furthermore, the commissary personnel expressed the same opinion. See Fig. 2.

TABLE III. ACCEPTABILITY TEST RESULTS*

Location of Test	Alaskan Breaded Shrimp (hedonic rating)	30% Breaded Shrimp (hedonic rating)	40% Breaded Shrimp (hedonic rating)
NAVSUPRANDFAC Taste Panel	6.36	7.57	--
NAVSUPRANDFAC Taste Panel	6.86	--	7.76

*A hedonic rating of 6.00-6.99 means "Like Slightly".
A hedonic rating of 7.00-7.99 means "Like Moderately".

Fig. 2 - Appearance of one portion of Alaskan Breaded Shrimp on Navy tray. NAVSUPRANDFAC Photo No. 898-2.

Discussion of Findings

Even though the Alaskan breaded shrimp has characteristics quite different from those of Navy-issue 30% and 40% breaded shrimp, it was an acceptable item, as shown by the hedonic ratings. The NSIA subcommittee on Prefabricated Foods considered the Alaskan breaded shrimp an acceptable item, but made the following comments:

1. "The shrimp breading material appears to contain corn meal, making it grittier and coarser than usual breading found on Navy-issue shrimp."

2. "It does not look like shrimp."

3. "Its flavor was slightly different from Navy-issue breaded shrimp products."

4. "Its texture was drier."

Because of the above noted differences in appearance, texture and flavor, the NSIA subcommittee concurred with the NAVSUPRANDFAC recommendation that the Alaskan breaded shrimp should be considered as a shrimp "patty" or "burger", and not as a substitute per se for conventional Navy-issue breaded shrimp.

During the field acceptability test, the enlisted personnel (participants) and galley personnel indicated that a portion of four Alaskan breaded shrimp represents an adequate serving. This was further substantiated by the NAVSUPRANDFAC commissary personnel and civilian technologists.

WEIGHT AND COST PER PORTION

Procedure

The weight per portion of Alaskan breaded shrimp was obtained by first determining the weight of 200 shrimp, and from this calculating the weight of four shrimp (1 portion).* For the 30% and 40% Navy-issue breaded shrimp, the portion weight was based on a portion-size established in the Navy Recipe Service Card H Fish No. 20, issue 5 for French Fried Shrimp.

The cost per portion of Alaskan breaded, and 30% and 40% Navy-issue breaded shrimp was determined in the following manner:

1. The cost per pound (A.P.) of Alaskan breaded shrimp was obtained from the supplier(5).

*The portion size for Alaskan breaded shrimp was established during the Field Acceptability tests (see preceding section).

2. The range in cost per pound A.P. of 30% and 40% Navy-issue breaded shrimp was obtained from the Federal Supply Catalog FSC 89 Price List over a one year period commencing July 1961 and terminating June 1962. The cost analyses were based on the highest and lowest prices for this period.

3. The cost per portion was obtained by multiplying the weight per portion (expressed in lb) by the cost per lb A.P.

Findings

1. The weight per portion, cost per pound, and cost per portion are given in Table IV.

Discussion of Findings

The manufacturer stated that the cost per pound of Alaskan breaded shrimp will be lower as the plant volume and efficiency increases. Consequently, it can be expected that the cost of the subject item will be consistently lower than Navy-issue breaded shrimp. The cost of Alaskan Breaded Shrimp was compared with 30% and 40% Navy-issue breaded shrimp on a pound basis in Table IV. It should be noted that the minimum cost per pound of Alaskan Breaded Shrimp ($0.78/lb) was less than (a) the cost of 30% Breaded Shrimp throughout the year, and (b) the cost of 40% Breaded Shrimp in a 9 out of 12 month period.* Based on cost per portion, the Alaskan breaded shrimp would have been cheaper to serve than 30% Navy-issue breaded shrimp (on a 12 month basis) and, in 11 of the 12 months, cheaper than 40% Navy-issue breaded shrimp.*(6)(7)

The Alaskan breaded shrimp should be used as a shrimp "patty" or "burger" and, therefore, the cost differences should be viewed with this consideration in mind.

*This is based on a twelve month period commencing July 1961 and ending June 1962.

TABLE IV. COMPARISON OF PORTION SIZE (A.P.), COST PER POUND (A.P.) AND COST PER PORTION

Product	Portion Size* (oz., A.P.)	Cost Per Lb. (A.P.)		Cost Per Portion	
		Minimum	Maximum	Minimum	Maximum
Alaskan Breaded Shrimp	4.8	$0.78	$0.85	$0.235	$0.255
30% Breaded Shrimp	5.7	$0.80	$1.02	$0.285	$0.363
40% Breaded Shrimp	5.7	$0.62	$0.92	$0.221	$0.328

*The portion size of 4.8 oz. represents 4 Alaskan Breaded Shrimp; whereas the 5.7 oz. represents 6 to 10, 30% or 40% Navy-issue Breaded Shrimp, depending upon size of shrimp being served. The 5.7 oz. portion size was determined experimentally; 600 Navy-issue breaded shrimp weighed 35.6 lbs. (or 5.7 oz./6 shrimp).

CHEMICAL ANALYSES

Procedure

The Alaskan breaded shrimp, and Navy-issue 30% and 40% breaded shrimp (with the tail shells removed) were chemically analyzed to establish the relative nutritive values. Samples of shrimp were taken before and after frying and submitted for proximate analysis. The proximate analysis consisted of determinations for moisture, fat, protein, ash, crude fiber and total carbohydrate content[8].

In addition, samples of shortening were removed and chemically analyzed to establish the relative condition of the shortening during the frying cycles. The chemical analyses on the fat samples consisted of determinations for free fatty acid value and iodine number[9][10].

Findings

1. On a 100 gram edible breaded shrimp basis (both raw and fried), the Alaskan breaded shrimp has nutritive values similar to both 30% and 40% Navy-issue breaded shrimp. See Table V.

2. On an edible portion size basis (after frying), the Alaskan breaded shrimp will be lower in protein, fat and caloric value than Navy-issue 30% and 40% breaded shrimp. This is due to the fact that after frying the portion edible weight of Alaskan breaded shrimp (3.3 oz/portion) is less than the portion edible weight of 30% and 40% Navy-issue breaded shrimp (4.2 oz/portion). See Table VI.

3. Shortening used in the laboratory tests had free fatty acid values ranging between 0.025% and 0.118%, and iodine numbers ranging between 48.4 and 52.9. Shortening used in the field tests had free fatty acid values ranging between 2.36% and 2.58%, and iodine numbers ranging between 50.5 and 55.0.

Discussion of Findings

Edible weight, as used in this report, constitutes the weight of the breaded shrimp without the tail shell. Alaskan breaded shrimp has no plate waste as compared to Navy-issue breaded shrimp which contains from 9% to 10% inedible tail shell.

Laboratory test results show that on an equal edible weight basis, the Alaskan breaded shrimp has a similar nutritive value to 30% and 40% Navy-issue breaded shrimp. However, on a portion basis the Alaskan breaded shrimp will yield less calories, protein and fat. This is due to the fact that after frying, the portion edible weight of Alaskan breaded shrimp (3.3 oz/portion) is less than the portion edible weight of 30% and 40% Navy-issue breaded shrimp (4.2 oz/portion). It should be noted that in all three types of shrimp, the biggest difference between the fat content of the raw and fried shrimp is due to fat absorption rather than portion size when equated on a raw E.P. basis.

The similarity between the shrimp products, as shown in Table V, can be used only to indicate that the Alaskan breaded shrimp tested were not adulterated.

TABLE V. COMPOSITION OF BREADED SHRIMP*

	Molded Alaskan Breaded Shrimp		Navy Stock Item 30% Breaded Shrimp		Navy Stock Item 40% Breaded Shrimp	
	Before Frying	After Frying	Before Frying	After Frying	Before Frying	After Frying
Calories(per 100 g)**	121.	279.	119.	261.	131.	267.
Moisture(g/100g)	69.10	45.00	69.00	50.90	66.30	48.10
Protein(g/100g)	10.90	14.30	11.70	13.90	11.00	13.50
Fat(g/100g)	0.50	12.60	0.30	14.30	0.20	13.70
Ash(g/100g)	1.20	1.00	1.40	1.50	1.00	2.00
Crude Fiber(g/100g)	0.05	0.10	0.25	0.20	0.10	0.20
Total Carbohydrate(g/100g)	18.29	27.00	17.35	19.20	21.40	22.50
Edible Matter(g/100g)	100.0	100.0	90.6	90.5	91.0	90.3
Inedible Matter(g/100g)***	0	0	9.4	9.5	9.0	9.7

*Moisture, protein, fat, ash, crude fiber, total carbohydrate and calories are based on the edible matter in the shrimp only.

**Calories per 100g edible matter calculated by using the following values:
Protein = 4 calories/g
Fat = 9 calories/g
Carbohydrate = 4 calories/g

***In regard to the 30% and 40% Navy-issue breaded shrimp, the inedible matter is the tail shell.

TABLE VI. COMPOSITION PER SERVING PORTION OF EDIBLE BREADED SHRIMP E.P.

	Alaskan Breaded Shrimp After Frying*	Navy Stock Item 30% Breaded Shrimp After Frying**	Navy Stock Item 40% Breaded Shrimp After Frying**
Calories (per portion)***	261	310	318
Moisture (g/portion)	42.1	60.6	57.3
Protein (g/portion)	13.4	16.5	16.1
Fat (g/portion)	11.8	17.0	16.3
Ash (g/portion)	0.9	1.7	2.3
Crude Fiber (g/portion)	0.09	0.23	0.23
Carbohydrates (g/portion)	25.2	23.8	26.8
Edible Matter (oz/portion)	3.3	4.2	4.2
Inedible Matter (oz/portion)	0.0	0.4	0.4

*Based on 4.8 oz (raw weight) Alaskan Breaded Shrimp A.P. prior to frying.

**Based on 5.7 oz (raw weight - with tail) Breaded Shrimp A.P. prior to frying.

***Calories calculated by using the following values:

1 oz = 28.35 grams
Protein = 4 Calories/gram
Fat = 9 Calories/gram
Carbohydrate = 4 Calories/gram

A comparison between the iodine numbers of the laboratory test fat (composed of fresh shortening) with the field test fat (composed of blend of old and fresh shortening) indicated that under the field test conditions oxidation was a minor cause of fat breakdown. This is to be expected since the Navy shortening used in the frying tests contained an antioxidant.

A comparison of the free fatty acid values between the laboratory and field test fats indicates that under the field test conditions hydrolysis was a major cause of fat breakdown. This is indicated by the large difference in the free fatty acid content between the laboratory (0.025% - 0.118%) and field (2.36% - 2.58%) frying fat.

GENERAL INFORMATION

The present ration allowance of 14 oz per person for "meat, boneless and semiboneless" was used as the ration allowance for the shrimp, and served as the basis for establishing the ration factor of 1.14 for Alaskan breaded shrimp. Miscellaneous data on Alaskan breaded shrimp are listed in Table VII.

TABLE VII. TECHNICAL DATA FOR ALASKAN BREADED SHRIMP

Subject	Data
"Break Out/100 men	30 lbs (1 case)
Portion Breaded Shrimp/man	4 shrimp (4.8 oz raw weight)
Case Cube	1.1 cu. ft.
Gross Weight	33 lbs
Net Weight	30 lbs
Number of packages/case	12 - 2½ lb packages/case
Approximate number of shrimp/case	400 Alaskan Breaded Shrimp
Frying temperature	350°F
Frying time	3 minutes

APPENDIX A

REFERENCES

1. Subsistence Material. FSC Group 89. NAVSANDA 1101A of 1 April 1962.

2. NAVSUBSOFC ltr FS2 Ser 4775 of 6 Oct 1961.

3. BUSANDA ltr W12 of 30 Jan 1962.

4. United States Standards for Grades of Frozen Raw Breaded Shrimp. July 1958. United States Department of the Interior. U. S. Fish and Wildlife Service. Bureau of Commercial Fisheries. Division of Industrial Research and Services.

5. Trans Marine Foods Inc. ltr to NAVSUPRANDFAC dtd Nov 21, 1962.

6. Single Manager Subsistence Supply Price List for Specification Perishable Items - Department of the Army Supply Manual SM-10-2-8900 (July 1961 - March 1962).

7. Subsistence Material, FSC Group 89, Supply Management Data and Price List - Department of Defense C 8900-ML (April 1962 - June 1962).

8. Association of Official Agricultural Chemists. Official Methods of Analyses. 9th ed. 1960. Para. 18.001, 18.005, 18.007, 18.010, 22.034.

9. Official and Tentative Methods of the American Oil Chemists Society vol I. Method Ca5a-40.

10. Official and Tentative Methods of the American Oil Chemists Society vol II. Method Ka9-51.

APPENDIX B

NAVY FOOD SURVEY FIELD TEST FORM

NAVY FOOD SURVEY

We need your help! The Navy tries all modern food improvements but needs your help to decide their suitability. The only real test is how well YOU like the foods. This survey is designed to secure your opinion on some of the foods served today.

After you finish eating, please answer all the questions on the form below. Remember, your answers will help decide what you eat in the future. Please return this form to the marked box at the scullery.

(A) Please circle the expression below which best describes your opinion of each of the foods. (For example, if you liked the meat moderately, circle the expression "Like Moderately" in the meat column. If you did not eat it, circle the expression "Did Not Eat". Do the same for each food.)

Did Not Eat	SHRIMP	Like Extremely	Like Very Much	Like Moderately	Like Slightly	Neither Like Nor Dislike	Dislike Slightly	Dislike Moderately	Dislike Very Much	Dislike Extremely
Did Not Eat	VEGETABLE	Like Extremely	Like Very Much	Like Moderately	Like Slightly	Neither Like Nor Dislike	Dislike Slightly	Dislike Moderately	Dislike Very Much	Dislike Extremely
Did Not Eat	DESSERT	Like Extremely	Like Very Much	Like Moderately	Like Slightly	Neither Like Nor Dislike	Dislike Slightly	Dislike Moderately	Dislike Very Much	Dislike Extremely

(B) Do you normally like the foods served? (Check Yes or No for each of the foods.)

SHRIMP Yes_____ No_____ VEGETABLE Yes_____ No_____ DESSERT Yes_____ No_____

(C) What is your pay grade?_____
What is your length of service?_____(Years)

(D) Remarks:

Naval Supply Research and Development Facility, Bayonne, N. J.

EVALUATION OF MOLDED ALASKAN BREADED SHRIMP, by H. Gorfien, B. MacNulty and I. Seidenberg. Aug. 1962. 12 p. app. tab. ref.

Alaskan breaded shrimp was evaluated and compared with Navy-issue 30% and 40% breaded shrimp. The test item was found to have good organoleptic, utility and nutritional values, and a favorable price position. However, since the Alaskan breaded shrimp is molded from small shrimp and has a different flavor and texture, it is recommended that Alaskan breaded shrimp be used in Navy general messes as a shrimp "patty" or "burger" rather than a replacement for Navy-issue breaded shrimp; particularly, when Navy-issue breaded shrimp is in short supply and the cost is deemed excessively high.

1. Shrimp
I. Gorfien, H.
II. MacNulty, B.
III. Title
IV. NT-F015-13-002-69-56
V. System No. 2202-06956-2

Naval Supply Research and Development Facility, Bayonne, N. J.

EVALUATION OF MOLDED ALASKAN BREADED SHRIMP, by H. Gorfien, B. MacNulty and I. Seidenberg. Aug. 1962. 12 p. app. tab. ref.

Alaskan breaded shrimp was evaluated and compared with Navy-issue 30% and 40% breaded shrimp. The test item was found to have good organoleptic, utility and nutritional values, and a favorable price position. However, since the Alaskan breaded shrimp is molded from small shrimp and has a different flavor and texture, it is recommended that Alaskan breaded shrimp be used in Navy general messes as a shrimp "patty" or "burger" rather than a replacement for Navy-issue breaded shrimp; particularly, when Navy-issue breaded shrimp is in short supply and the cost is deemed excessively high.

1. Shrimp
I. Gorfien, H.
II. MacNulty, B.
III. Title
IV. NT-F015-13-002-69-56
V. System No. 2202-06956-2

Naval Supply Research and Development Facility, Bayonne, N. J.

EVALUATION OF MOLDED ALASKAN BREADED SHRIMP, by H. Gorfien, B. MacNulty and I. Seidenberg. Aug. 1962. 12 p. app. tab. ref.

Alaskan breaded shrimp was evaluated and compared with Navy-issue 30% and 40% breaded shrimp. The test item was found to have good organoleptic, utility and nutritional values, and a favorable price position. However, since the Alaskan breaded shrimp is molded from small shrimp and has a different flavor and texture, it is recommended that Alaskan breaded shrimp be used in Navy general messes as a shrimp "patty" or "burger" rather than a replacement for Navy-issue breaded shrimp; particularly, when Navy-issue breaded shrimp is in short supply and the cost is deemed excessively high.

1. Shrimp
I. Gorfien, H.
II. MacNulty, B.
III. Title
IV. NT-F015-13-002-69-56
V. System No. 2202-06956-2

Naval Supply Research and Development Facility, Bayonne, N. J.

EVALUATION OF MOLDED ALASKAN BREADED SHRIMP, by H. Gorfien, B. MacNulty and I. Seidenberg. Aug. 1962. 12 p. app. tab. ref.

Alaskan breaded shrimp was evaluated and compared with Navy-issue 30% and 40% breaded shrimp. The test item was found to have good organoleptic, utility and nutritional values, and a favorable price position. However, since the Alaskan breaded shrimp is molded from small shrimp and has a different flavor and texture, it is recommended that Alaskan breaded shrimp be used in Navy general messes as a shrimp "patty" or "burger" rather than a replacement for Navy-issue breaded shrimp; particularly, when Navy-issue breaded shrimp is in short supply and the cost is deemed excessively high.

1. Shrimp
I. Gorfien, H.
II. MacNulty, B.
III. Title
IV. NT-F015-13-002-69-56
V. System No. 2202-06956-2